

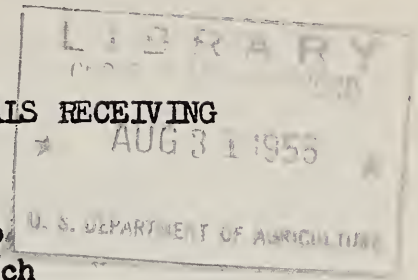
## **Historic, Archive Document**

Do not assume content reflects current scientific knowledge, policies, or practices.



PLASMA TOCOPHEROL LEVELS OF DAIRY ANIMALS RECEIVING  
DIFFERENT DIETS<sup>1/</sup>

by  
J. W. Thomas and M. Okamoto  
Dairy Husbandry Research Branch



Blood plasma tocopherol determinations on dairy cows and calves have been made using a modified hydrogenation procedure that was originally described by Quaife and Biehler in Journal of Biological Chemistry 159: 663, 1945.

Calves less than one month of age had very low plasma tocopherol levels but the concentration increased as they became older. The rate of increase and the ultimate level attained depended on other constituents of the diet as well as the tocopherol intake.

The tocopherol values obtained on calves and cows on various diets and levels of intake of tocopherol are presented in Table 1.

The calves in group 1 were reared under practical herd conditions and received whole milk until 4 to 6 weeks of age at the rate of 6-12 pounds per day, then skim milk until 8 months of age at the rate of 12-14 pounds per day. Three pounds of a simple grain mixture was fed until six months of age when it was increased to 4 pounds per day. Alfalfa hay, U. S. No. 2, was supplied ad libitum. After 6 months of age the male calves, group 2 fed the same as group 1, were allowed to graze on pasture.

The calves in groups 3 to 14 were fed whole or a synthetic milk at the rate of 10 to 12 pounds per hundredweight (cwt.) per day. The rations of some of these calves were supplemented with 2 to 4 pounds of alfalfa hay, 1 to 2.5 pounds of grain or with an equivalence of 50-200 mg. alpha tocopherol as a distilled acetylated tocopherol concentrate administered by capsule.

The heifers in groups 15 and 16 were reared on a limited milk-limited grain regime and received either U. S. No. 1 alfalfa hay or different kinds of silage as the roughage source.

---

<sup>1/</sup> Paper presented at the annual meeting of the American Dairy Science Association, Michigan State College, East Lansing, Michigan, June 20-23, 1955.



Plasma tocopherol levels were approximately the same for calves in groups 1, 3 or 15. The addition of either grain or alfalfa to calves on whole milk (groups 4 and 5) increased the plasma levels but to a smaller degree than did the addition of 50 mg. of alpha tocopherol (groups 6 and 7). Higher amounts of alpha tocopherol supplementation (groups 8, 9 and 10) did not materially increase the plasma level over the level attained with a supplement of 50 mg./day. The addition of alfalfa hay or grain to calves receiving a daily supplement of 50 mg. alpha tocopherol did not increase the level above those receiving only the 50 mg. of alpha tocopherol.

Calves receiving a synthetic milk (group 12) composed of casein, cerelose, lactose, lard, minerals and vitamins with alpha tocopherol added to furnish 20 mg. per cwt. showed a decrease in plasma level as age increased. The calves on this and lower intakes of tocopherol eventually developed vitamin E deficiency symptoms. They were cured by injection and feeding large amounts of the vitamin daily. Supplementation of this synthetic diet with a capsule containing 50 mg. alpha tocopherol increased plasma levels and prevented any deficiency from developing.

Supplementing the calves on the synthetic diet with 50 mg. of alpha tocopherol did not produce plasma values as high as did supplementing whole milk fed calves with an equivalent amount (groups 13 and 14 compared with groups 6 and 7). Whole milk which furnished approximately 5 to 6 mg. tocopherol per cwt. produced higher plasma tocopherol levels than did synthetic milk which furnished 20 mg./cwt.

Female calves receiving silage, (legume, grass, or corn) had higher plasma tocopherol levels than calves receiving alfalfa hay (compare groups 15 and 16). Similarly, cows receiving green feed had higher levels than one cow that was restricted to alfalfa hay. The calves in group 2 that were placed on pasture showed a higher value than those in group 1 that received no green feed.

Calves with diarrhea or other digestive upsets had materially lower values than normal. When alpha tocopherol supplements were given to calves with diarrhea only a slight and very slow increase in plasma level occurred. The same amount of supplement given to other calves would produce an immediate 3 to 4 fold increase in plasma level.

This preliminary information indicates that the amount of intake, type of diet and condition of animal influence the level of tocopherol in the blood plasma of dairy animals.

Table 1.-Alpha tocopherol levels in the blood plasma of dairy animals on various diets at the ages indicated

Group	Description of animals and diet	Breed	Average number of animals per month	Age in months						
				1	2	3	4 to 6	7 to 9	10 to 12	12
1	Herd calves - normal	H & J	8	.082	.145	.105	.110	.160	.155	.163
2	Herd calves on pasture	"	3	-	-	-	-	.271	.448	.271
3	Calves fed only whole milk	"	13	.096	.089	.100	.149	.153	.152	.074
4	As above plus grain	"	4	.038	.152	.135	.116	.135	.511	.245
5	As above plus alfalfa	"	5	-	-	-	.192	.220	.216	.238
6	As in group 3 plus 50 mg. E/day <sup>1/</sup>	J	7	-	.876	1.073	.803	.794	.819	.784
7	" " " 50 mg. E/day	H	4	-	-	.254	.552	.449	-	-
8	" " " 100 mg. E/day	"	2	-	-	-	.440	.405	.550	-
9	" " " 125 mg. E/day	"	2	-	-	-	.320	.535	.813	.602
10	" " " 200 mg. E/day	J	2	-	-	-	-	-	-	.600
11	Whole milk plus grain or alfalfa plus 50 mg. E/day	H & J	2	-	-	.135	.173	.614	.481	.853
12	Calves fed synthetic milk (20 mg. tocopherol/cwt.)	"	3	.207	.180	.094	.067	.050	-	.053
13	As in group 12 plus 50 mg. E/day	"	4	.340	.580	.388	.357	.386	.423	.632
14	" " " 100 mg. E/day	"	2	-	-	-	.149	.586	-	.296
15	Heifers fed alfalfa hay and grain	"	4	-	.213	.118	.169	.166	.110	-
16	" " silage and grain	"	4	-	.085	.219	.254	.445	.537	.692
17	Cow fed alfalfa hay only	H	1	-	-	-	-	-	-	.240
18	" " " , corn silage, grain	H & J	3	-	-	-	-	-	-	.675
19	Cows fed clipped orchard grass	J	3	-	-	-	-	-	-	.693
20	" " " "	H & J	6	-	-	-	-	-	-	.918

<sup>1/</sup> Vitamin E fed as alpha tocopherol.

